

A NOTE ON IMMERSED BOUNDARY FORMULATION FOR ELASTIC BODIES IN FLUIDS

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Application of the immersed boundary (IB) method in the simulation of the motion of freely suspended rigid or elastic particles in fluids, has been reported in literature. In this method a force density term is added to the fluid equations, in the regions occupied by the particles, to account for their presence. The force density term is calculated from the constitutive equation of the elastic material. Consequently, both the viscous and elastic stress terms are calculated in the particle domain within which there should have been, in accordance with the physical and mathematical models, only the elastic stress term. Nevertheless, the approach of the immersed boundary formulation has been implemented with encouraging results. In this paper we address this apparent discrepancy. We conjecture that if $\eta U / GL$ (η – fluid dynamic viscosity, G – elastic shear modulus, U – velocity scale, L – length scale) is small, which may often be the case, then the IB and its extended formulations should be expected to yield good results.